INSTALLATION OF FLEXIBLE LINING WITH FLEXIBLE COLLAR FOR LINING LATERAL PIPELINES

BACKGROUND OF THE INVENTION

This invention relates to the lining of pipelines or passageways, using flexible tubular materials which are impregnated with curable synthetic resin and which, when placed in position lining the pipeline or passageway are held by fluid pressure against the pipeline or passageway surface until the resin cures to a hard condition leaving a hard lining pipe lying on the pipeline or passageway surface.

The most widely practised method using such resin impregnated linings is disclosed in British Patent No. 1449455 from which it will be seen that the impregnated lining is applied to the pipeline or passageway surface by eversion of same into the pipeline or passageway, using fluid pressure.

The present invention is concerned with lining pipelines which are called "laterals" insofar as they enter sidewise a main pipeline or passageway, such as a main sewer. Of any particular main line, there may be a plurality of laterals entering the main line, and it frequently arises that the laterals have to be lined by means of a resin impregnated tube. Using existing methods for lining laterals, it is not possible to perform any lining operation of a second or subsequent lateral whilst the lining in one lateral is being cured. As the cure time may take up to 5 or 6 hours, if a section of main line having say 5 laterals to be lined is involved, the minimum total time to line all laterals will be in the order of 25 to 30 hours. As these lining operations are required to be carried out during the night for purposes of convenience, it is often the case that the completion of the work has to take place over

several evenings and therefore the work crew must depart the site and return at a later date to complete the work.

The present invention is concerned with providing an arrangement wherein the completion of a plurality of lateral lining operations may be effected in a much shorter period.

SUMMARY OF THE INVENTION

In accordance with the present invention, a plurality of laterals meeting a common main line are lined by inserting resin impregnated linings into said laterals and to hold same in position by fluid pressure whilst curing of the resin takes place, and after insertion of each lining, a seal arrangement at the location where the lateral meets the main line enables the second and subsequent laterals to be lined whilst the first or previously inserted lining is held in position and is being cured.

The seal arrangement may comprise a flexible bag which is pressurised with the medium which urges the lining against the lateral surface so as to prevent escape of the pressurising medium, but such bag allowing pressure fluid supplying pipes to pass to the inside or outside of the bag and to other lateral connections downstream of the bag in the main pipe whereby such other laterals may be lined by the eversion there into of a resin impregnated lining tube, the holding of the lining tube to the lateral surface being affected by fluid pressure, and a sealing bag retaining the lining in position and forming a seal between the lateral and the main line.

It will be seen that by using the method, the linings for the laterals can be inserted sequentially, and held in installed position under pressure, and cured simultaneously. A plurality of laterals can be lined and cured in a total time equal to the time it takes to line

one lateral multiplied by the number of laterals plus the curing time for one of the lateral linings which total time in the case of 5 laterals may be in the order of 8 hours, which is a considerable reduction from the 25–30 hours which are required for the lining of 5 laterals by the conventional method. For example therefore the lateral lining on any particular contract may be capable of being completed in one evening as opposed to being completed in stages over two or three evenings.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, wherein:

FIG. 1 is a diagrammatic side elevation showing the method by which a lateral is lined in accordance with the method of the invention;

FIG. 2 is a sectional elevation taken on the line II—II;

FIG. 3 is an enlarged sectional view of the detail ringed III in FIG. 1;

FIG. 4 is an enlarged sectional view of the detail ringed IV in FIG. 1;

FIG. 5 is a sectional side view of an alternative form of apparatus for carrying out the method of the invention.

FIG. 6 is an end view of the arrangement shown in FIG. 5; and

FIG. 7 is a perspective view of the lining tube used in the method of FIGS. 5 and 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, in FIG. 1 a main line 10 is intersected by a lateral 12 which is to be lined in

VERSION WITH MARKINGS TO SHOW CHANGES MADE

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several evenings and therefore the work crew must depart the site and return at a later date to complete the work.

The present invention is concerned with providing an arrangement wherein the completion of a plurality of lateral lining operations may be effected in a much shorter period.

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It will be seen that by using the method, the linings for the laterals can be inserted sequentially, and held in installed position under pressure, and cured simultaneously. A plurality of laterals can be lined and cured in a total time equal to the time it takes to line

one lateral multiplied by the number of laterals plus the curing time for one of the lateral linings which total time in the case of 5 laterals may be in the order of 8 hours, which is a considerable reduction from the 25–30 hours which are required for the lining of 5 laterals by the conventional method. For example therefore the lateral lining on any particular contract may be capable of being completed in one evening as opposed to being completed in stages over two or three evenings.

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Embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, wherein:

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FIG. 2 is a sectional elevation taken on the line II—II;

FIG. 3 is an enlarged sectional view of the detail ringed III in FIG. 1;

FIG. 4 is an enlarged sectional view of the detail ringed IV in FIG. 1;

FIG. 5 is a sectional side view of an alternative form of apparatus for carrying out the method of the invention.

FIG. 6 is an end view of the arrangement shown in FIG. 5; and

FIG. 7 is a perspective view of the lining tube used in the method of FIGS. 5 and 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, in FIG. 1 a main line 10 is intersected by a lateral 12 which is to be lined in

IN THE CLAIMS

Please cancel claims 1 - 7 and add new claims 9 - 17, as follows:

9. A method of lining a lateral pipe leading into a main pipe from the main pipe out, comprising

providing a resin impregnated lateral lining tube of finite length and open ended having at one end a collar of resin impregnated material with a central opening, the collar at the end of the lateral adapted to extend into the main pipe and contact the interior surface of the main pipe at the location where the lateral meets the main pipe with the opposite end of the lateral lining extending into the lateral,

positioning the collar in the main pipe at the entrance to the lateral with the opening in the collar aligned with the lateral;

inserting the lateral lining into the lateral pipe using a fluid medium under pressure to evert the liner through the opening in the collar,

applying pressure to the lateral lining tube, and

applying fluid pressure to the collar on the surface of the main pipe to cure the collar against the main pipe and form a seal at the location where the lateral meets the main pipe as curing of the resin takes place.

10. The method according to claim 9, wherein the seal is formed by an inflatable means, said means being inflated by the fluid medium used for inserting the lateral lining, but at a lower pressure.

11. The method according to claim 9, wherein the fluid medium is supplied to insert the lateral lining, by means of a pressure pipe, and at least one additional pressure pipe extends past the seal arrangement so that pressure fluid can be applied to another lateral lining remote from the first mentioned lateral whilst curing of the first mentioned lateral lining is taking place.

12. The method according to claim 10, wherein the inflatable means comprises a bag or bladder which is inflated against the main pipe surface.

13. The method according to claim 12, wherein the bag or bladder is in the form of a pair of spaced diametrically opposed inflatable pillows.

14. A method of lining a lateral pipe leading into a main pipe, comprising

providing a resin impregnated lateral lining tube of finite length and open ended and having at one end a collar of resin impregnated material with a central opening, the collar at the end of the lateral adapted to extend into the main pipe and contact the interior surface of the main pipe at the location where the lateral meets the main pipe with the opposite end of the lateral lining extending into the lateral,

inserting the lateral lining into the lateral pipe and using a fluid medium under pressure expanding the lateral lining against the lateral wall,

applying pressure to the lateral lining tube, and

applying fluid pressure to the collar on the surface of the main pipe to cure the collar against the main pipe and form a seal at the location where the lateral meets the main pipe as curing of the resin takes place.

15. The method according to claim 14, including applying pressure to the collar by an inflatable means which is a bag or bladder.

16. The method according to claim 15, including pressing the collar against the main pipe by an inflatable means connected to an elbow pipe and inverting the lateral lining through the elbow pipe into the lateral.

17. A method to claim 14, wherein the seal arrangement is formed by use of an elbow pipe to position the lateral lining at the entrance to the lateral and through which the lateral lining is everted to be inserted into the lateral.

REMARKS

This continuation application and Preliminary Amendment have been filed in order to present new method claims 9 - 17 for examination. Claims 9 - 17 substantially conform to claims as issued in prior application No. 394,622 filed on February 27, 1995 and now U.S. Patent No. 5,624,629 issued on April 29, 1997.

The new method claims presented herewith for examination differ from the claims as previously issued with respect to definition of the liner being installed. The claims here as in the prior application and issued patent are all directed to the method of installation. Specifically, the claims define the lateral liner as including collar at the end of the lateral, but is no longer defined as being bonded to the tubular portion collar as previously recited in claims 1 and 7 of the '629 Patent. The method is not altered whether the collar at the end of the lateral which remains in the main line after installation is bonded or integral to the tubular portion inserted into the lateral pipeline.

Claim 4 of the '629 Patent is dependent on claim 1 and recites that the lateral lining is everted into the lateral. Claim 1 already recites that the lateral lining is everted through the opening in the collar. This claim is properly dependent on independent method claim 7 of the patent and has been included in this application as claim 15 dependent on independent method claim 14.

A Terminal Disclaimer disclaiming the statutory term of any patent granted on this application which would extend beyond the expiration date of the full statutory term of co-pending application Serial No. 08/941,605 or U.S. Patent No. 5,624,629.

Pursuant to the duty of disclosure set forth in 37 C.F.R. §1.55(a) in consistent with 37 C.F.R. §§1.97 and 1.98, applicant respectfully submits herewith citations of which he is aware, which may be material to the examination of the this application and respect of which there may be a duty to disclose in accordance with 37 C.F.R. §1.55 and §1.56.

A PTO/SB/08A identifying the citations is enclosed. Each of these references were cited during prosecution of at least one of the parent applications. Accordingly, copies have not been included pursuant to 37 C.F.R. §1.98(d).

This Information Disclosure Statement is not intended to constitute an admission that any of the patents referred to herein is "prior art" unless specifically designated as such. The filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material and information as defined in 37 C.F.R. §1.56(a) exists.

This Information Disclosure Statement is being filed prior to issuance of a first Office Action. Accordingly, no fee is due pursuant to 37 C.F.R. §1.97(b).

This application is a continuation application of application Serial No. 08/941,605, filed on September 30, 1997 which in turn is a divisional application of application Serial No. 08/599,045 filed February 9, 1996, now U.S. Patent No. 5,975,878 issued on November 2, 1999, which in turn is a division of application Serial No. 08/394,622 filed on February 27, 1995, now U.S. Patent No. 5,624,629 issued on April 29, 1997, which in turn is a continuation of Serial No. 07/934,678 filed on September 10, 1992, now U.S. Patent No. 5,393,481 issued on February 28, 1995, which was a PCT national phase filing of PCT/GB91/00628 filed pursuant to Section 371 with an international filing date of April 22, 1991, and claiming priority of United Kingdom application No. 9009073.9, filed on April 23, 1990. It is respectfully requested that this application history be printed on the face of the patent to issue.

It is respectfully submitted that claims 9 - 17 presented herewith for examination are patentable for the reasons previously set forth in connection with prosecution of application Serial No. 08/394,622 and immediate parent application Serial No. 08/941,605. With respect to the method of installation the manner in which the collar is fixed to the end of the lateral liner is not significant and the claims should encompass installation performed utilizing that method whether the collar is integral with or a separate element secured to the end of the lateral liner.

For the reasons set forth herein and in the prior applications, the undersigned respectfully submits that claims 9 - 17, presented herewith for examination, are patentable over the references cited in notice to that effect is respectfully requested. The Examiner is respectfully requested to examine this application at an early date with a view towards

issuing a favorable action thereon. If upon review of the application, the Examiner is unable to issue an immediate Notice of Allowance, the Examiner is respectfully requested to telephone the undersigned attorney with a view towards resolving the outstanding issues.

Early and favorable action is earnestly solicited.

Respectfully submitted,

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Enclosures

IN THE ABSTRACT

Please add a new Abstract as follows:

- - ABSTRACT OF THE DISCLOSURE

A method for installation of a flexible resin impregnable liner for lining a lateral pipe which leads into a main pipe having at one end a flexible collar for installation at the location where the lateral liner meets the main, wherein after installation the collar extends along the interior of the main seating against the opening of the lateral. The flexible liner is installed by inserting the liner into the lateral pipe and using fluid under pressure to expand the lining against the lateral wall to form seals with the collar at the lateral/main pipe junction.- -